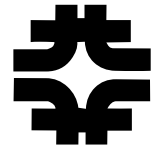# Slip stacking Operation and Future Plan
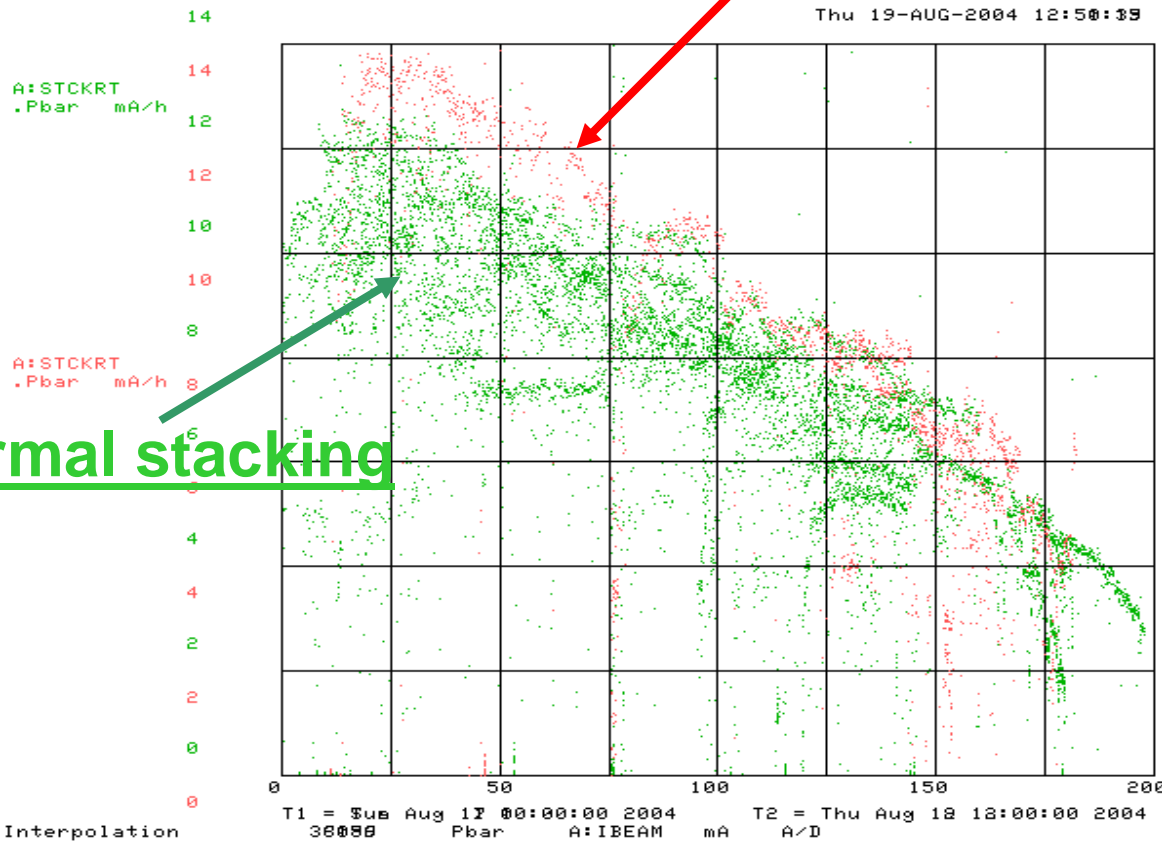
Kiyomi Seiya

Fermilab

March 29, 2005

Effect of slip stacking on stack rate
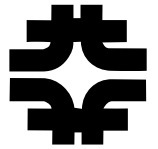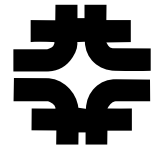

With Slip stacking

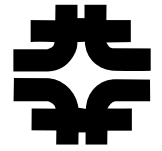With normal stacking

Outline

- Status of slip stacking operation

- Issues
  - Emittance from Booster
  - Balancer circuit for bunch rotation

- Future plans

Our goal for pbar stacking

- Intensity: 8E12 [ppp] (particle per pulse)

- Bunch length at extraction: < 1.5 nsec

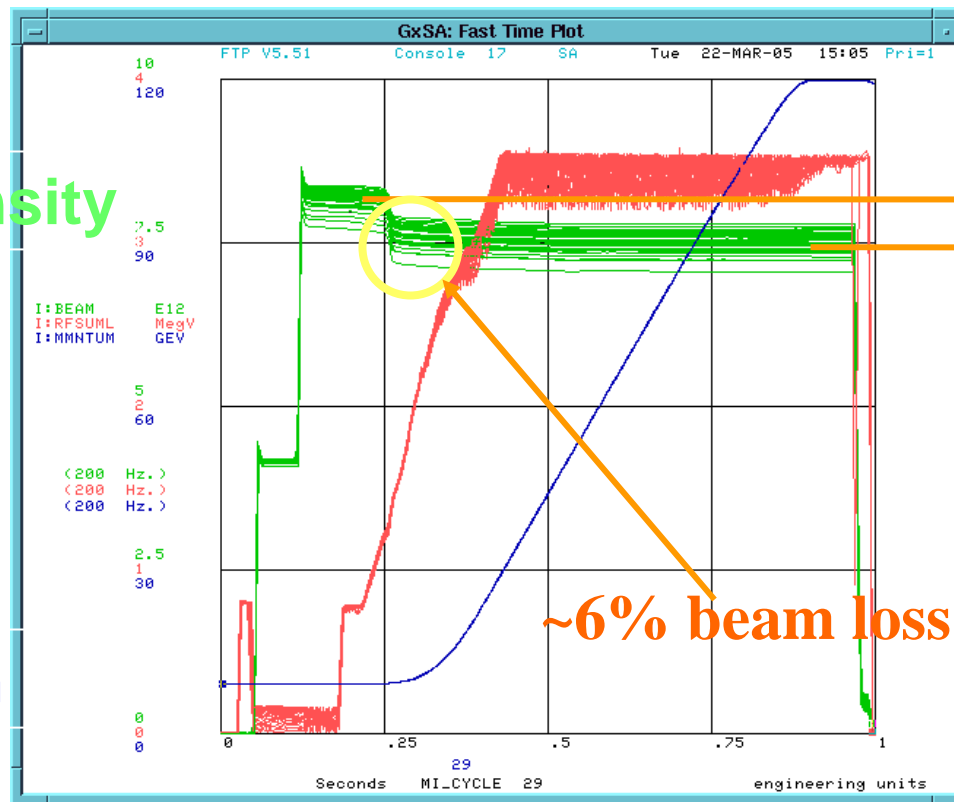- Time of slip stacking process: 200msec
  (<3 Booster cycles)

Intensity on stacking cycle

- Intensity @ ext.: 7.5E12

8.0E12 @ inj.

7.5E12 @ ext.

Beam intensity

Momentum

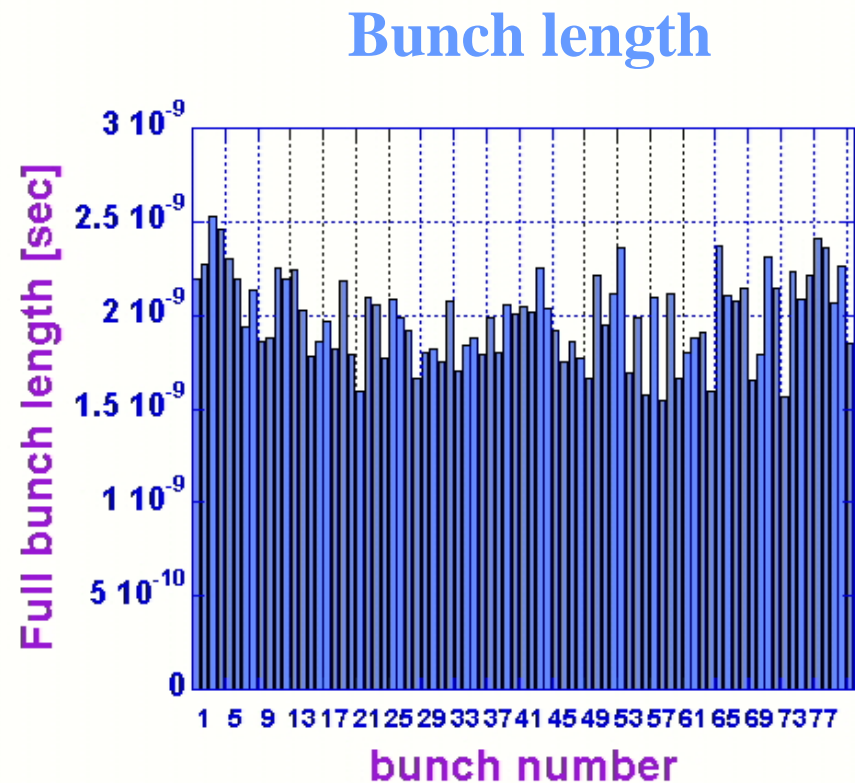**~6% beam loss**

WCM signal and bunch length at extraction

- Bunch length @ ext.: ~1.8 nsec

WCM signal
(1batch = 84 bunches)
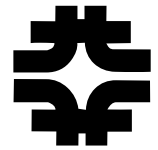
Bunch length
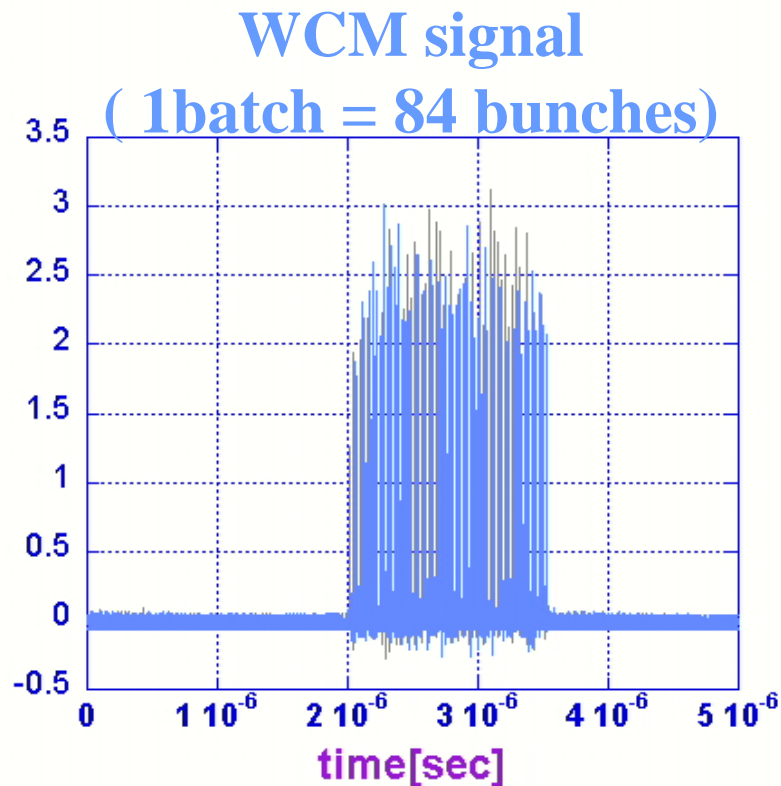
Intensity on Pbar target

- Intensity on Pbar target: 7.0E12

Beam in MI
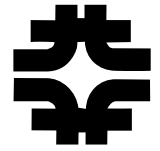
Beam on target

7.5E12 @ MI ext.
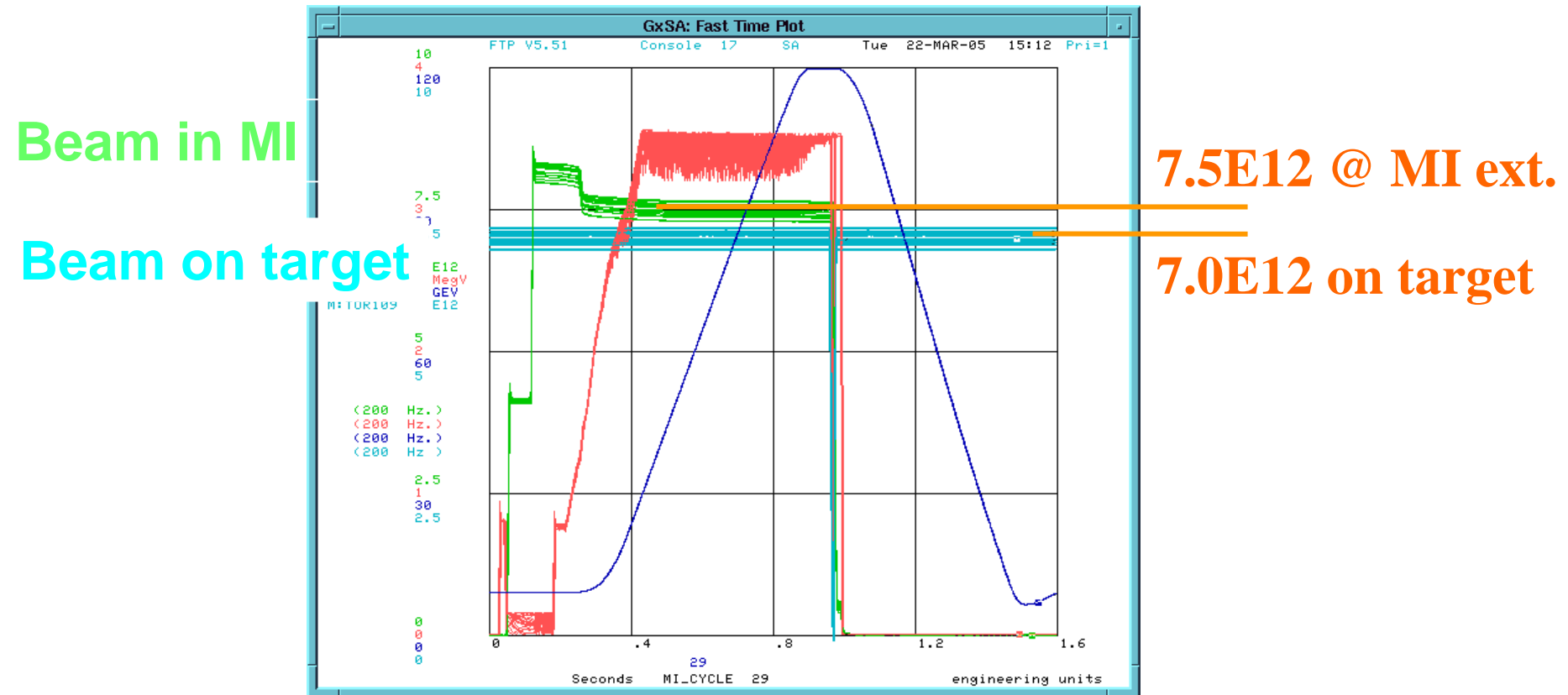
7.0E12 on target

Operation condition on stacking cycle

Beam at MI ext.

Beam on target

Beam to abort
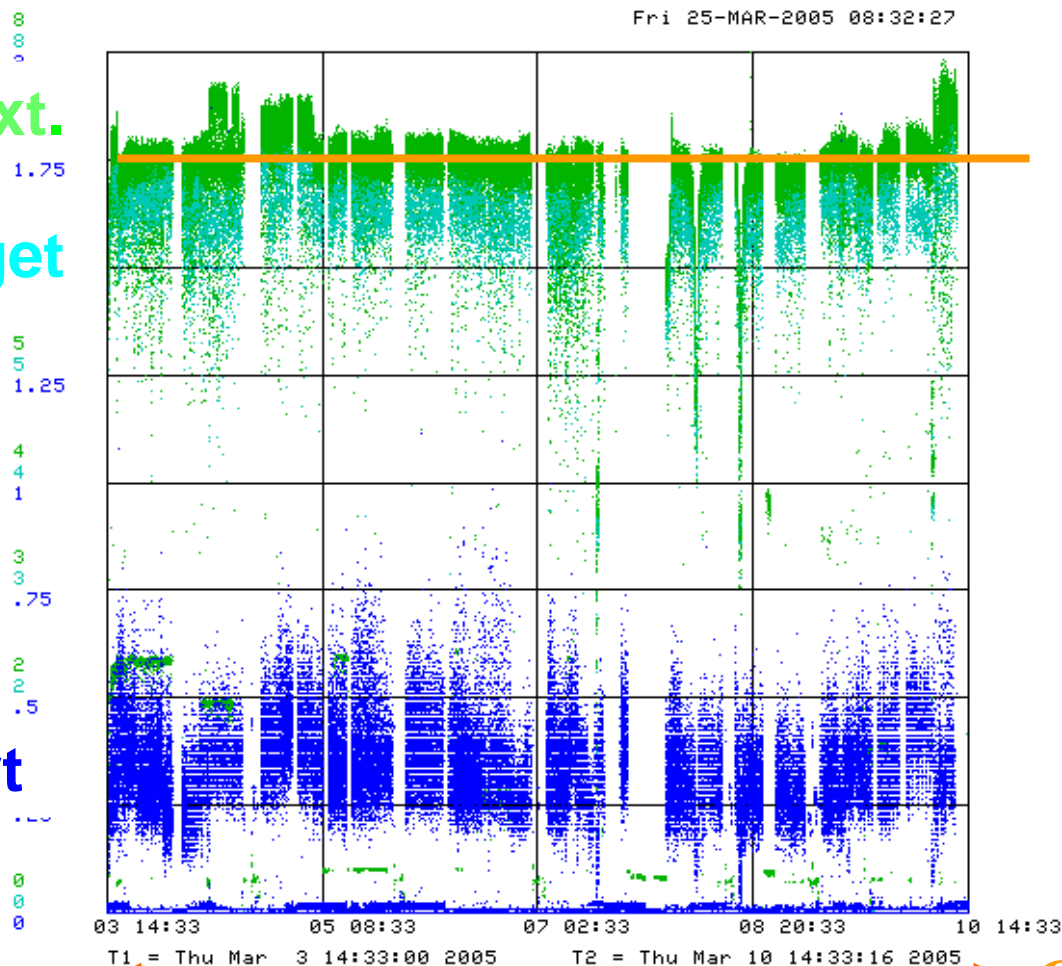
7.0E12

One week
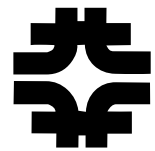
Status
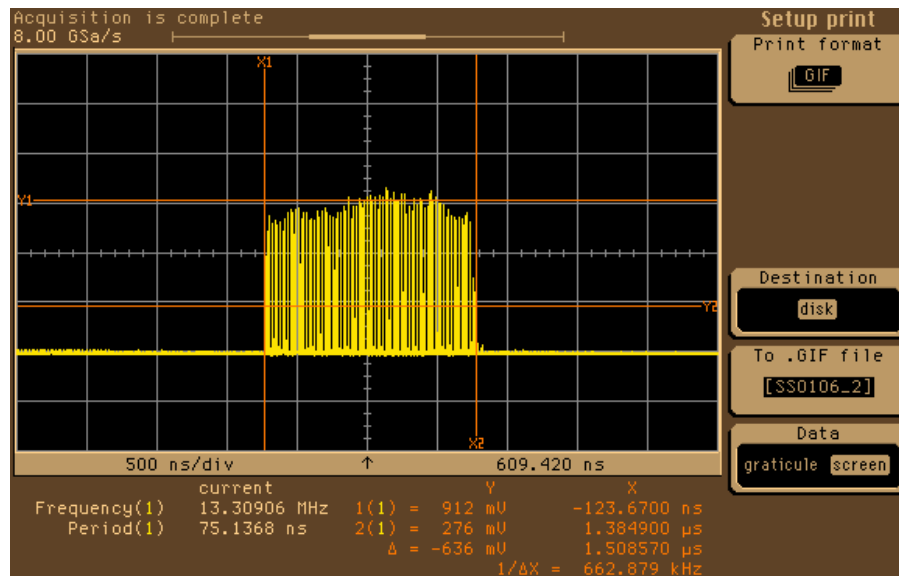
- Intensity: 7.5E12 (@ MI ext.)
  - Intensity @ inj.: 8.0E12
  - Intensity on Pbar target: 7.0E12
  - Intensity to abort line: 0.5E12

- Bunch length @ ext.: 1.8 nsec
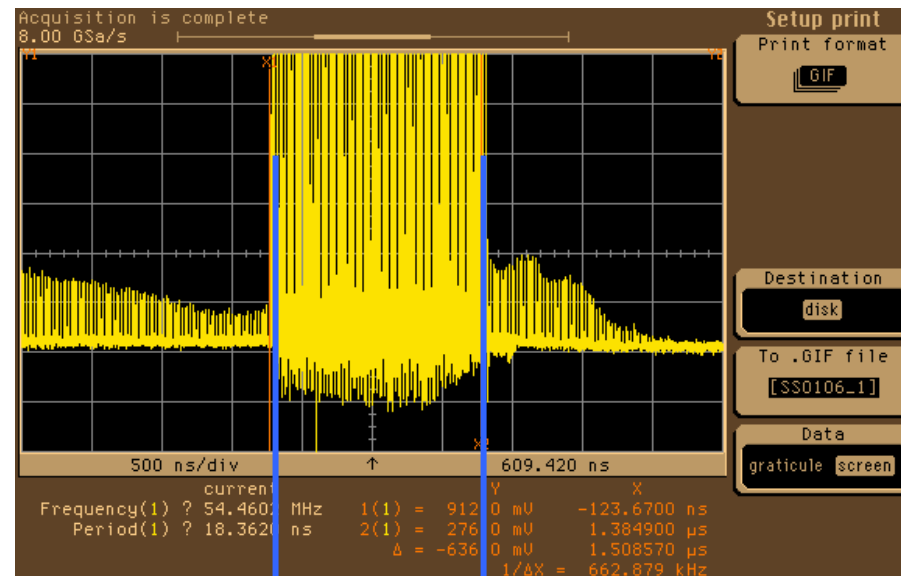
- Time of slip stacking process: 184 msec

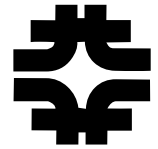# Wall current monitor at extraction
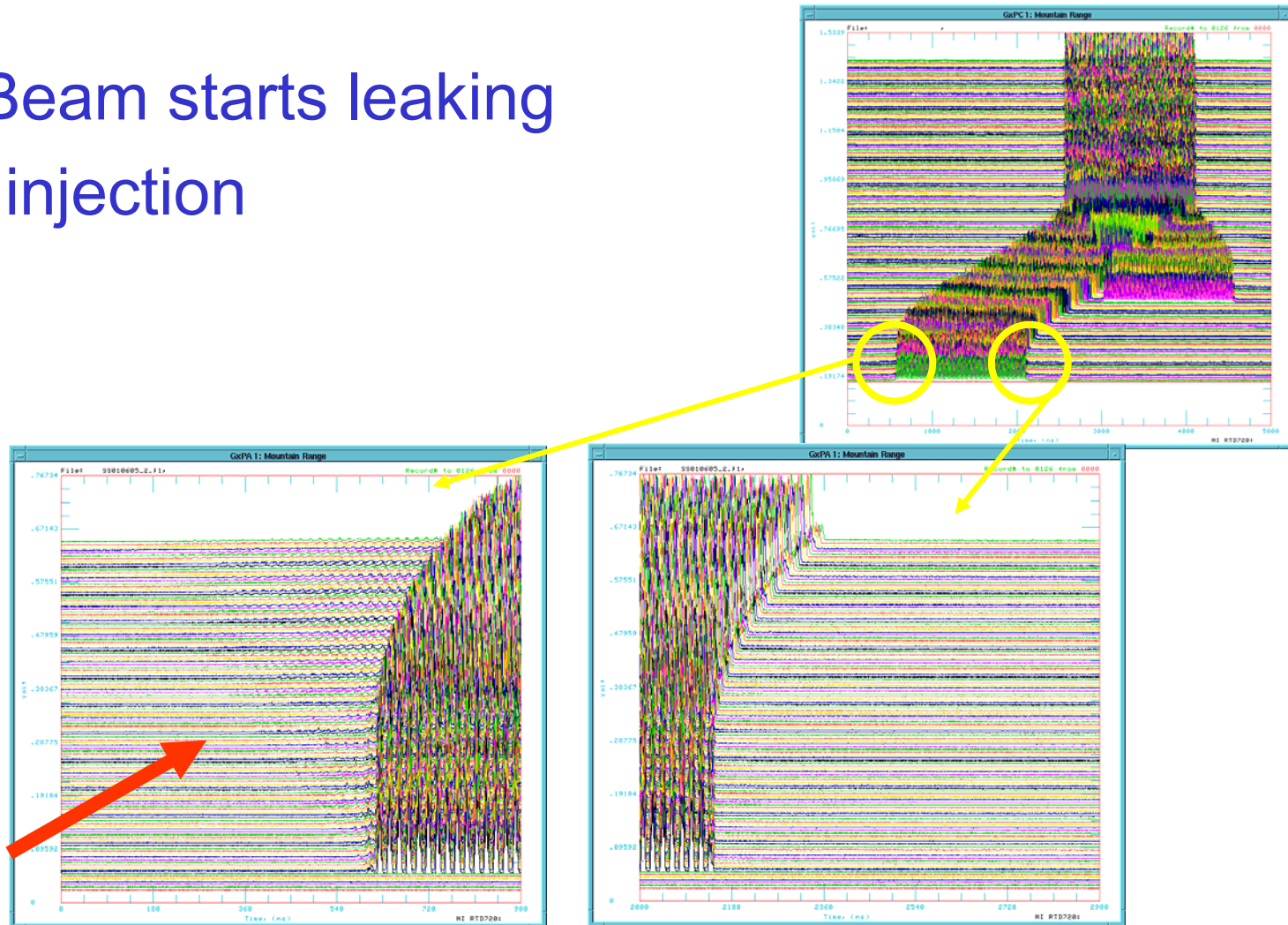

300mV/div

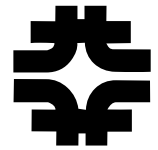10mV/div

82 bunches to target

WCM signal at injection
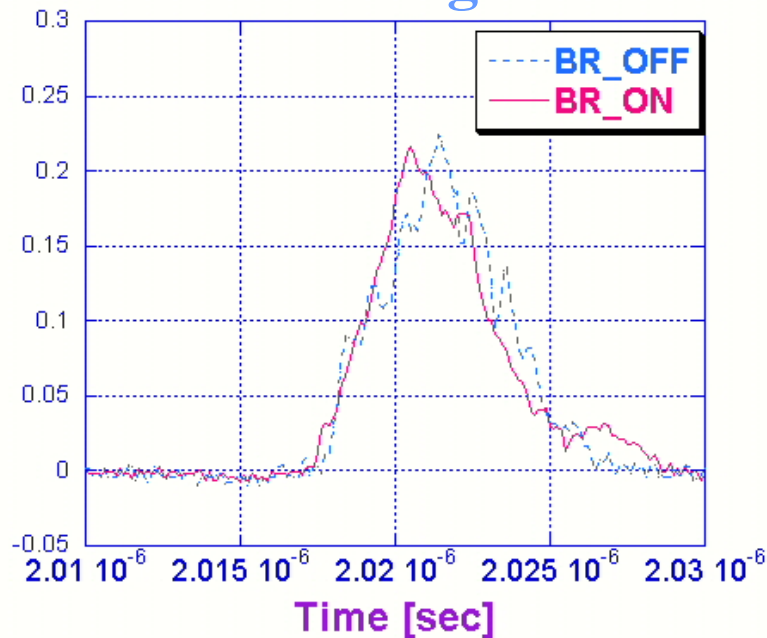
- Beam starts leaking
  at injection

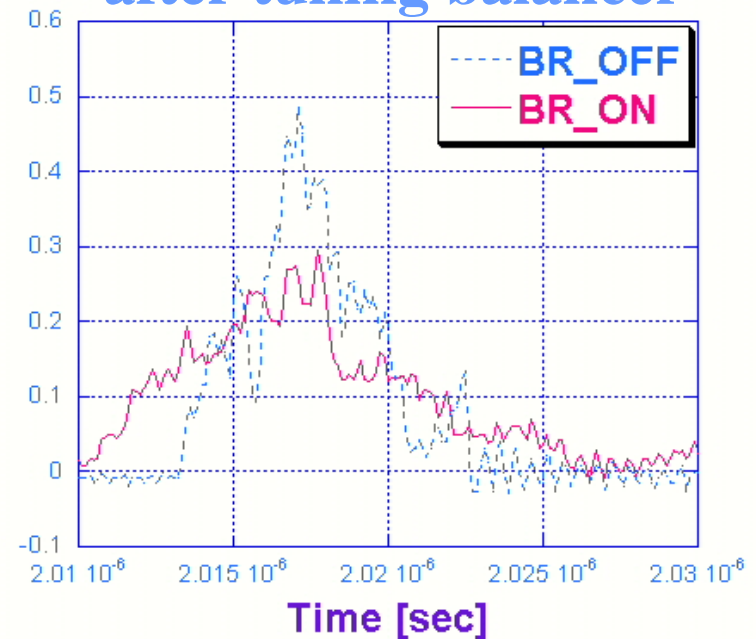# WCM signal at injection with and w/o bunch rotation

- Tuned up balancer in Booster for bunch rotation
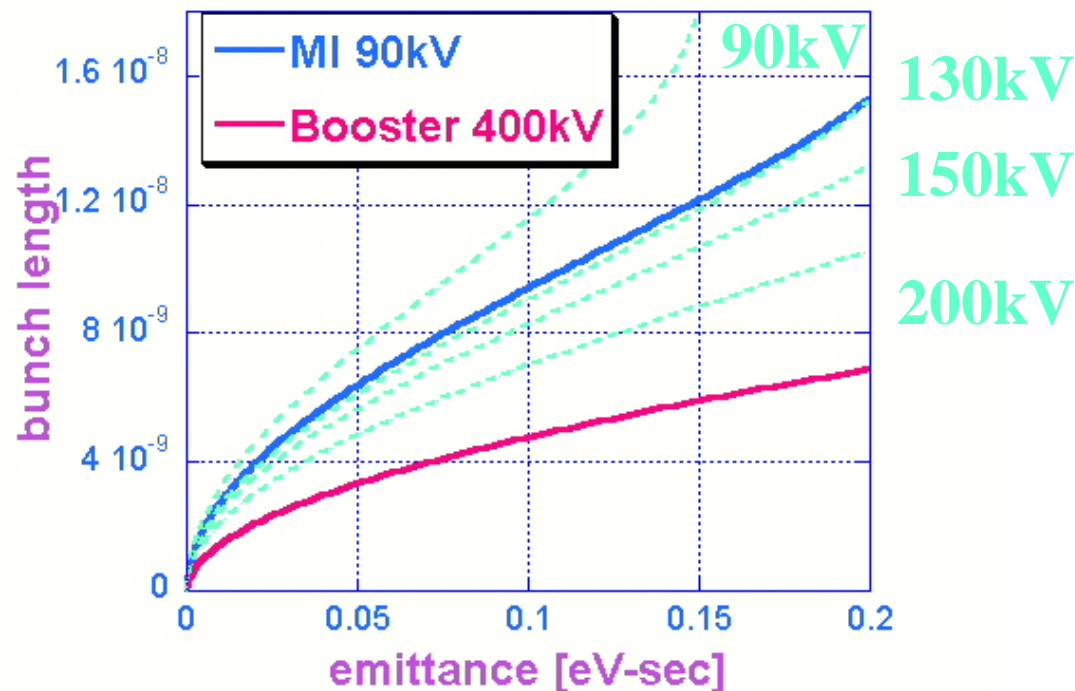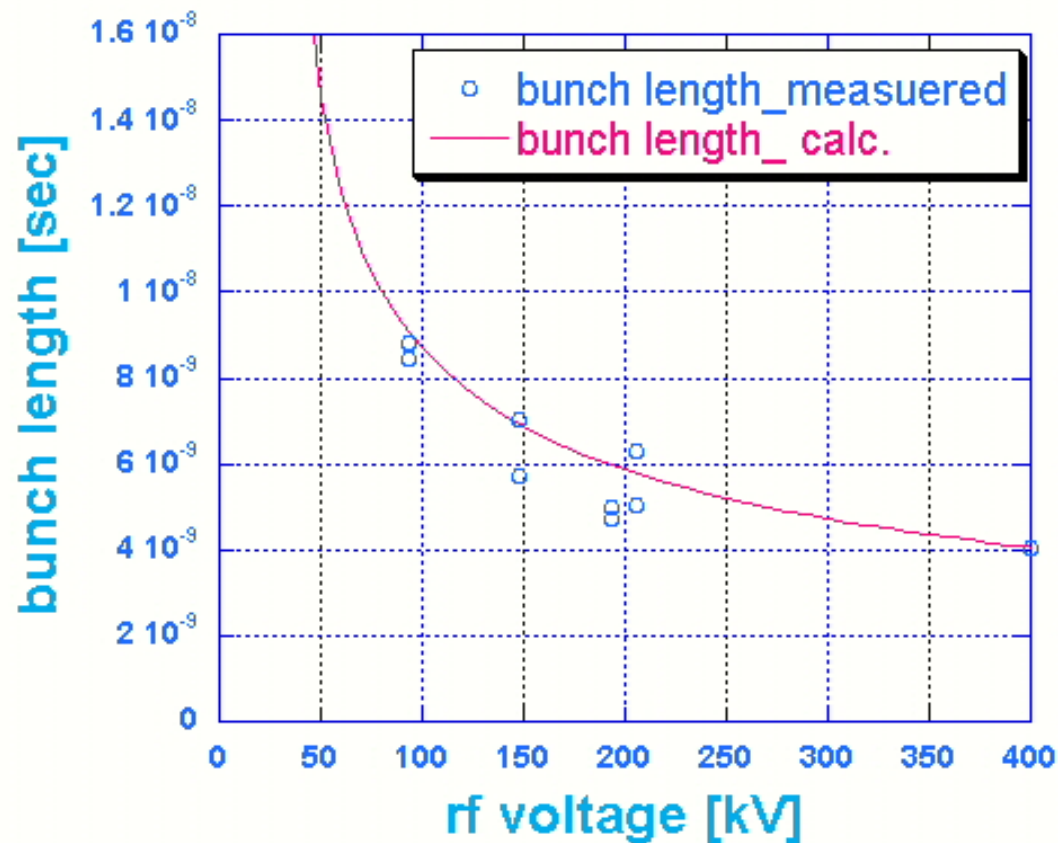

before tuning balancer
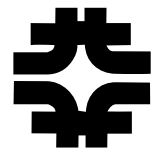

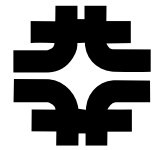after tuning balancer

Bunch rotation at Booster extraction
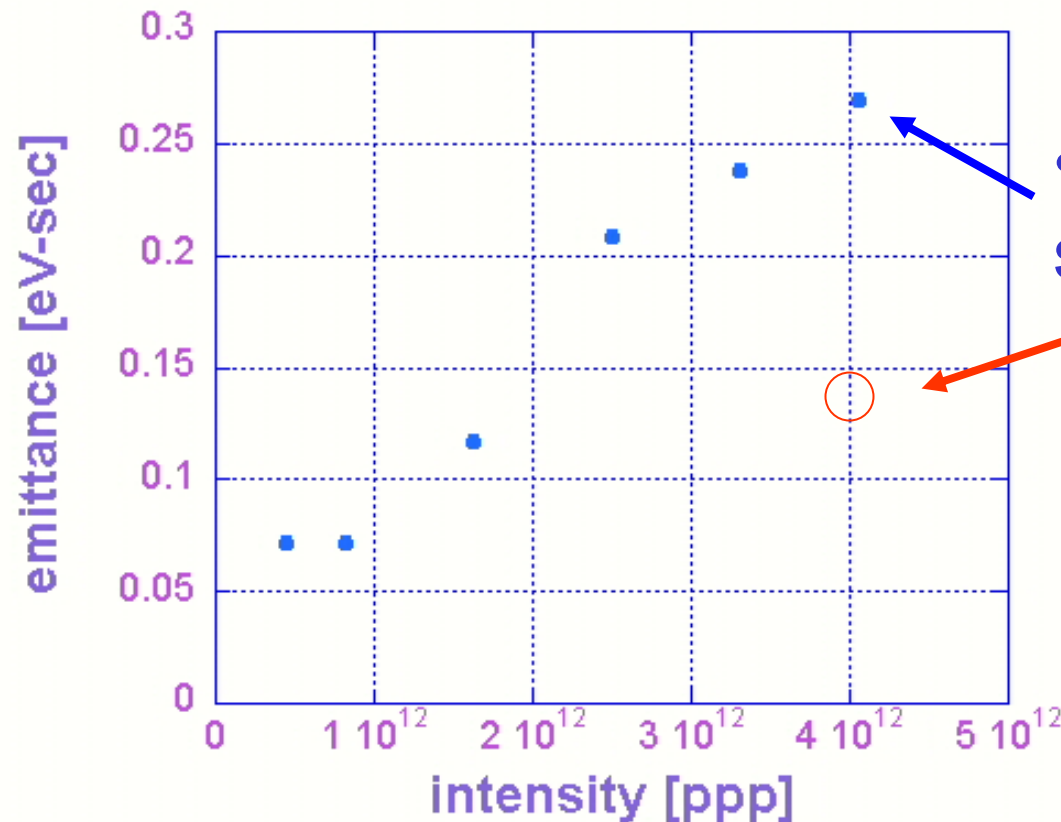
- Vrf @ Booster ext. : 400kV ⬅➡ Vrf @MI inj. : 90kV

Bunch rotation study with low intensity

Beam emittance vs Intensity from Booster

• w/o bunch rotation
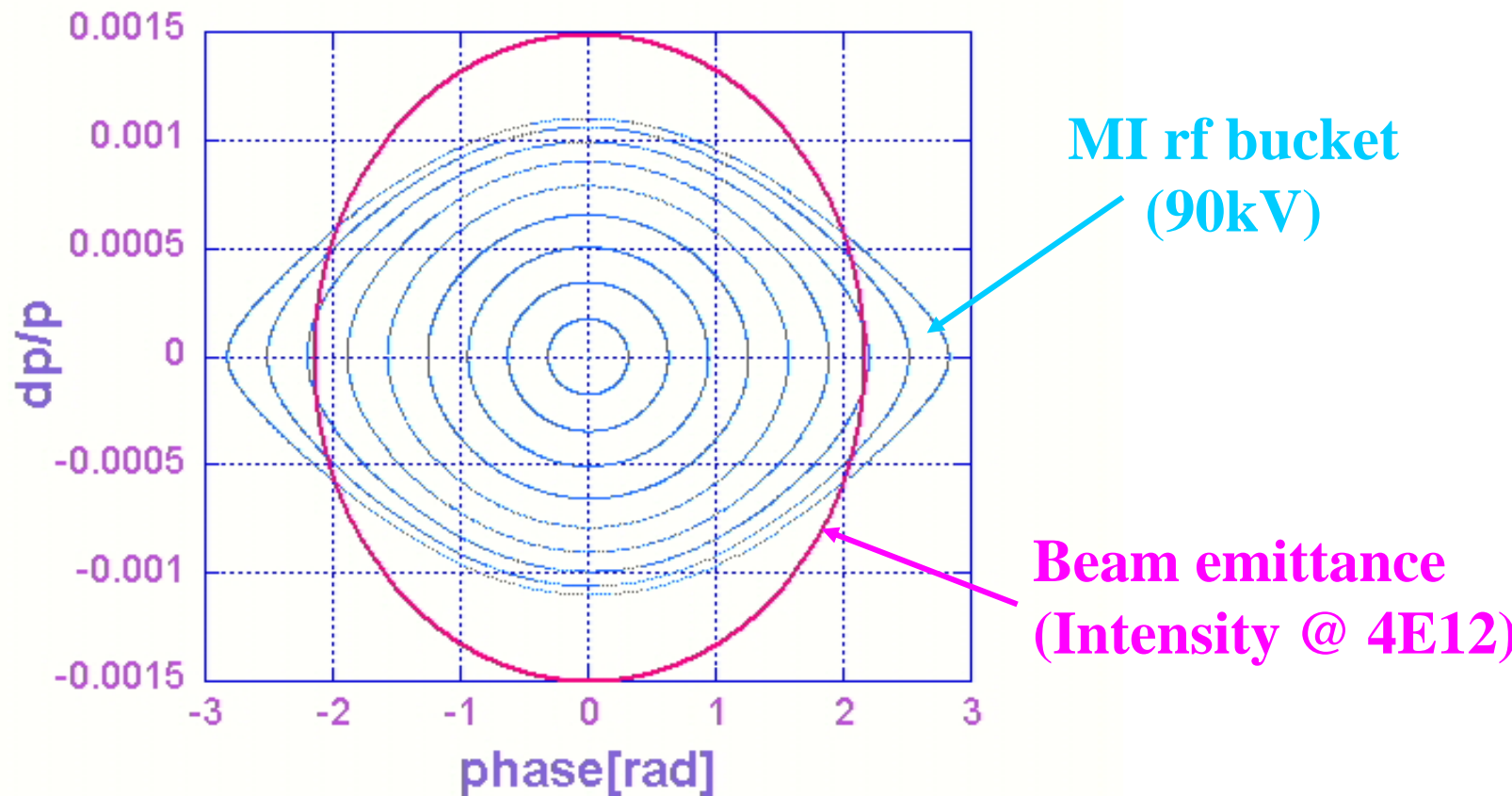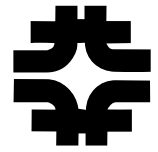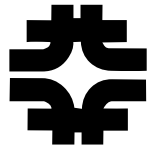
•two times bigger since shutdown

Beam emittance on MI rf bucket

MI rf bucket (90kV)

Beam emittance (Intensity @ 4E12)

Future plan

- To fix un-captured beam at injection
  - Emittance from Booster
  - Balancer circuit for bunch rotation

- Increase intensity to 8E12 on TARGET

- Slip stacking for multi-batch operation
  - Simulation
  - Beam study

Double intensity on Numi multi-batch